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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/689,433	10/20/2003	Wen Tong	7000-298	2810

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WITHROW & TERRANOVA, P.L.L.C.
P.O. BOX 1287
CARY, NC 27512

EXAMINER	
MILLER, BRANDON J	

ART UNIT	PAPER NUMBER
2683	

DATE MAILED: 12/27/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/689,433	TONG ET AL.	
	Examiner	Art Unit	
	Brandon J. Miller	2683	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-40 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-40 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 20 October 2005 is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-3, 11-17, 25-31, and 35-37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gore in view of Sugar.

Regarding claim 1 Gore teaches a wireless communication system comprising: M antennas (see col. 3, lines 25-27 and col. 4, lines 32-34). Gore teaches transmit and control circuitry operatively coupled to the M antennas (see col. 4, lines 41-46 and Fig. 1). Gore teaches selecting N antennas from the M antennas based on control information (see col. 4, lines 32-38 & 47-57). Gore teaches creating data signals from information to be transmitted to a receiver and transmitting the data signal to the receiver via the N antennas (see col. 4, lines 3-10 & 30-32). Gore does not specifically teach N data streams. Sugar teaches simultaneous communication of signal streams between a plurality of antennas (see paragraph [0004]). It would have been obvious to one of ordinary skill in the art at the time the invention was made to make the device adapt to include N data streams because multiple data signals can constitute a stream of data an it would allow for improved capacity and/or range of a wireless radio communication link between two radio communication devices.

Regarding claim 2 Gore teaches control information that includes or is derived from channel conditions between the M antennas and a plurality of antennas of the receiver (see col. 4, lines 50-63).

Regarding claim 3 Gore and Sugar teach a device as recited in claim 2 except for wherein the receiver has N antennas. Gore does teach wherein the receiver has a plurality of antennas (see col. 4, lines 6-10). It would have been obvious to one of ordinary skill in the art at the time the invention was made to make the device adapt to include wherein the receiver has N antennas because this would allow for improved capacity and/or range of a wireless radio communication link between two radio communication devices.

Regarding claim 11 Sugar teaches a weighting factor that is included in or derived from control information (see paragraphs [0020] & [0021]).

Regarding claim 12 Gore teaches receive circuitry associated with at least one of the M antennas and the transmit and control circuitry, which is further adapted to receive the control information from the receiver (see col. 4, lines 41-46 and Fig. 1).

Regarding claim 13 Gore and Sugar teaches a device as recited in claim 1 except for the transmit and control circuitry is adapted to select the N antennas corresponding to a maximum determinant from channel matrices representing the channel conditions between the M antennas and the N antennas of the receiver. Gore does teach transmit and control circuitry that is adapted to select the N antennas corresponding to a determinant representing the channel conditions between the M antennas and the N antennas of the receiver (see col. 4, lines 47-63). Sugar teaches a maximum determinant representing channel conditions (see paragraphs [0023] & [0024]). It would have been obvious to one of ordinary skill in the art at the time the invention

was made to make the device adapt to include the transmit and control circuitry is adapted to select the N antennas corresponding to a maximum determinant from channel matrices representing the channel conditions between the M antennas and the N antennas of the receiver because this would allow for improved capacity and/or range of a wireless radio communication link between two radio communication devices.

Regarding claim 14 Sugar teaches wherein the receiver is a user element and the wireless communication system is a base station (see paragraph [0018]).

Regarding claim 15 Gore teaches a method providing wireless communications via a wireless communication system comprising M antennas (see col. 3, lines 25-27 and col. 4, lines 32-34). Gore teaches selecting N antennas from the M antennas based on control information (see col. 4, lines 32-38 & 47-57). Gore teaches creating data signals from information to be transmitted to a receiver and transmitting the data signal to the receiver via the N antennas (see col. 4, lines 3-10 & 30-32). Gore does not specifically teach N data streams. Sugar teaches simultaneous communication of signal streams between a plurality of antennas (see paragraph [0004]). It would have been obvious to one of ordinary skill in the art at the time the invention was made to make the device adapt to include N data streams because multiple data signals can constitute a stream of data an it would allow for improved capacity and/or range of a wireless radio communication link between two radio communication devices.

Regarding claim 16 Gore and Sugar teach a device as recited in claim 2 and is rejected given the same reasoning as above.

Regarding claim 17 Gore and Sugar teach a device as recited in claim 3 and is rejected given the same reasoning as above.

Regarding claim 25 Gore and Sugar teach a device as recited in claim 11 and is rejected given the same reasoning as above.

Regarding claim 26 Gore and Sugar teach a device as recited in claim 12 and is rejected given the same reasoning as above.

Regarding claim 27 Gore and Sugar teach a device as recited in claim 13 and is rejected given the same reasoning as above.

Regarding claim 28 Gore and Sugar teach a device as recited in claim 14 and is rejected given the same reasoning as above.

Regarding claim 29 Gore teaches a wireless communication system comprising: M antennas (see col. 3, lines 25-27 and col. 4, lines 32-34). Gore teaches transmit and control circuitry operatively coupled to the M antennas (see col. 4, lines 41-46 and Fig. 1). Gore teaches selecting N antennas from the M antennas based on control information (see col. 4, lines 32-38 & 47-57). Gore teaches generating a plurality of data signals to be transmitted to a receiver. Gore does not specifically teach providing a Fourier transform on the data streams to provide a plurality of orthogonal frequency division multiplex sub-carriers, such that the sub-carriers are allocated to the select N antennas based on the control information, and transmitting sub-carriers via the N antennas to the receiver. Sugar teaches providing a Fourier transform on the signal streams to provide a plurality of orthogonal frequency division multiplex sub-carriers, such that the sub-carriers are allocated to the select N antennas, and transmitting sub-carriers via the N antennas to the receiver (see paragraph [0039]). It would have been obvious to one of ordinary skill in the art at the time the invention was made to make the device adapt to include providing a Fourier transform on the data streams to provide a plurality of orthogonal frequency division

multiplex sub-carriers, such that the sub-carriers are allocated to the select N antennas based on the control information, and transmitting sub-carriers via the N antennas to the receiver because this would allow for improved capacity and/or range of a wireless radio communication link between two radio communication devices.

Regarding claim 30 Gore and Sugar teach a device as recited in claim 2 and is rejected given the same reasoning as above.

Regarding claim 31 Gore and Sugar teach a device as recited in claim 3 and is rejected given the same reasoning as above.

Regarding claim 35 Gore teaches a method providing wireless communications via a wireless communication system comprising: M antennas (see col. 3, lines 25-27 and col. 4, lines 32-34). Gore teaches selecting N antennas from the M antennas based on control information (see col. 4, lines 32-38 & 47-57). Gore teaches generating a plurality of data signals to be transmitted to a receiver. Gore does not specifically teach providing a Fourier transform on the data streams to provide a plurality of orthogonal frequency division multiplex sub-carriers, such that the sub-carriers are allocated to the select N antennas based on the control information, and transmitting sub-carriers via the N antennas to the receiver. Sugar teaches providing a Fourier transform on the signal streams to provide a plurality of orthogonal frequency division multiplex sub-carriers, such that the sub-carriers are allocated to the select N antennas, and transmitting sub-carriers via the N antennas to the receiver (see paragraph [0039]). It would have been obvious to one of ordinary skill in the art at the time the invention was made to make the device adapt to include providing a Fourier transform on the data streams to provide a plurality of orthogonal frequency division multiplex sub-carriers, such that the sub-carriers are allocated to

the select N antennas based on the control information, and transmitting sub-carriers via the N antennas to the receiver because this would allow for improved capacity and/or range of a wireless radio communication link between two radio communication devices.

Regarding claim 36 Gore and Sugar teach a device as recited in claim 2 and is rejected given the same reasoning as above.

Regarding claim 37 Gore and Sugar teach a device as recited in claim 3 and is rejected given the same reasoning as above.

Claims 4-10, 18-24, 32-34, and 38-40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gore in view of Sugar and Ling.

Regarding claim 4 Gore and Sugar teach a device as recited in claim 1 except for selecting a redundant antenna other than the N antennas from the M antennas; applying a weighting factor to one of the N data streams to create a weighted data stream; and transmitting the weighted data stream to the receiver via the redundant antenna concurrently with the N data steams, wherein transmission of the weighted data stream reinforces the one of the N data streams during transmission. Gore teaches selecting another antenna set other than the N antennas and the M antennas (see col. 5, lines 22-25). Sugar teaches applying a weighting factor to one of the signal streams to create a weighted signal stream and transmitting the weighed signal stream to the receiver via the antenna simultaneously with other signal streams (see paragraphs [0018] & [0019]). Ling teaches transmitting redundant information on different antennas (see paragraphs [0066] & [0109]). Ling teaches transmission of a redundant data stream that reinforces the original data stream during transmission (see paragraph [0233]). It would have been obvious to one of ordinary skill in the art at the time the invention was being

made to make the device adapt to include selecting a redundant antenna other than the N antennas from the M antennas; applying a weighting factor to one of the N data streams to create a weighted data stream; and transmitting the weighted data stream to the receiver via the redundant antenna concurrently with the N data steams, wherein transmission of the weighted data stream reinforces the one of the N data streams during transmission because this would allow for an improved method of processing signals in a multiple-input multiple-output (MIMO) communication system to recover the transmitted signals, and to estimate the characteristics of a MIMO channel.

Regarding claim 5 Sugar teaches applying a second weighting factor to the one of the signal streams prior to transmitting one of the signal streams, wherein the weighting signal stream and the one of the other signal streams having the second weighting factor are concurrently transmitted (see paragraphs [0018] & [0019]).

Regarding claim 6 Sugar teaches the weighting factor includes or is derived from channel conditions between the M antennas and a plurality of antennas of the receiver (see paragraph [0018] and Fig. 1).

Regarding claim 7 Sugar teaches the N antennas are selected and the weighting factor is determined to optimize channel capacity (see paragraphs [0019] & [0020]).

Regarding claim 8 Sugar teaches wherein the N antennas are selected and the weighting factor is determined to optimize signal-to-noise ratios (see paragraphs [0020] & [0022]).

Regarding claim 9 Gore, Sugar, and Ling teach a device as recited in claim 4 and is rejected given the same reasoning as above.

Regarding claim 10 Gore, Sugar, and Ling teach a device as recited in claim 5 and is rejected given the same reasoning as above.

Regarding claim 18 Gore, Sugar, and Ling teach a device as recited in claim 4 and is rejected given the same reasoning as above.

Regarding claim 19 Gore, Sugar, and Ling teach a device as recited in claim 5 and is rejected given the same reasoning as above.

Regarding claim 20 Gore, Sugar, and Ling teach a device as recited in claim 6 and is rejected given the same reasoning as above.

Regarding claim 21 Gore, Sugar, and Ling teach a device as recited in claim 7 and is rejected given the same reasoning as above.

Regarding claim 22 Gore, Sugar, and Ling teach a device as recited in claim 8 and is rejected given the same reasoning as above.

Regarding claim 23 Gore, Sugar, and Ling teach a device as recited in claim 4 and is rejected given the same reasoning as above.

Regarding claim 24 Gore, Sugar, and Ling teach a device as recited in claim 5 and is rejected given the same reasoning as above.

Regarding claim 32 Gore, Sugar, and Ling teach a device as recited in claim 4 and is rejected given the same reasoning as above.

Regarding claim 33 Gore, Sugar, and Ling teach a device as recited in claim 5 and is rejected given the same reasoning as above.

Regarding claim 34 Gore, Sugar, and Ling teach a device as recited in claim 6 and is rejected given the same reasoning as above.

Regarding claim 38 Gore, Sugar, and Ling teach a device as recited in claim 4 and is rejected given the same reasoning as above.

Regarding claim 39 Gore, Sugar, and Ling teach a device as recited in claim 5 and is rejected given the same reasoning as above.

Regarding claim 40 Gore, Sugar, and Ling teach a device as recited in claim 6 and is rejected given the same reasoning as above.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Trikkonen et al. Pub. No.: US 2004/0002364 A1 discloses transmitting and receiving methods.

Gorokhov Pub. No.: US 2005/0003863 A1 discloses a method of selecting a subset of antennas among a plurality of antennas in a diversity system.

Haustein et al. Pub. No.: US 2004/0171385 A1 discloses an adaptive signal processing method in a MIMO-system.

Levy US 6,580,926 B1 discloses a communication method between a base station with N antennae and a mobile phone and base station for implementing the same.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Brandon J. Miller whose telephone number is 571-272-7869. The examiner can normally be reached on Mon.-Fri. 8:00 am to 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, William Trost can be reached on 571-272-7872. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

December 20, 2005

WILLIAM TROST
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600